WAYMO

Waymo LLC
1600 Amphitheatre Parkway
Mountain View, CA 94043

March 26, 2018

Department of Motor Vehicles
Occupational Licensing Branch
2570 24th Street
Sacramento, CA 95818
ATTN: Elizabeth Humphreys Mail Station H325

Dear Ms. Humphreys:

This is in response to your letter dated February 16, 2018 regarding Waymo LLC's AV Disengagement report for the period of December 1, 2016 through November 30, 2017. You requested that we explain the meaning of certain terms used in our report to categorize the causes of reported disengagements and examples of such disengagements. The specific terms you requested be defined were: unwanted maneuver of the vehicle, perception discrepancy, hardware discrepancy and software discrepancy. Below are the meanings of these types of disengages and examples of incidents involving such disengages.

Unwanted Maneuver of the Vehicle - This represents an event when our self-driving car (SDC) was performing a driving behavior that was undesirable under the circumstances. An example is when our vehicle began to make a shallow left turn and came close to the vehicle in the adjacent left turn lane. The driver disengaged to nudge away from the adjacent vehicle.

Perception Discrepancy - In this type of event, a component of the vehicle's perception system (e.g., camera, lidar, radar) fails to detect an object correctly. An example was the failure of our self-driving car to recognize that a "no right on red" lighted sign was activated. This sign is only active for a specific time period during the day. The driver disengaged to prevent the car from making a right on red even though there was no risk of collision.

Hardware Discrepancy - This means that our SDC diagnostics, which are set very conservatively and run thousands of checks per second, received a message indicating a potential performance issue with a hardware component of the self-driving system or a component of the base vehicle. Such an event triggers a notice to the driver to assume control. One example of this category is when a diagnostics message related to the engine control module was activated and triggered a notice, causing our driver to take control.

Software Discrepancy - This means that our SDC diagnostics received a message indicating a potential performance issue with a software component. There are thousands of checks on the vehicle continually running. If such diagnostics cause an error message the driver would get a message to take control of the vehicle. An example of this category is when

cross-validation checks run by our self-driving system on our vehicle's position triggered an error message, causing our driver to take control.

We trust that these descriptions provide the understanding of our cause categories that you requested. As we've said in our report, Waymo over nine years has developed a robust process to collect, analyze and evaluate disengages for this report, and we set disengagement thresholds conservatively for our public road testing, while operating safely. More information on our testing and development program can be found at waymo.com/safetyreport.

Please call if you would like to discuss further.

Sincerely,

Ron Medford
Director of Safety